

Soil Testing Following Flooding, Overland Flow of Wastewater and other Freshwater Disasters

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Freshwater flooding from rivers, overflowing sewage and septic systems and other sources can have a significant effect on soil fertility and the physical and chemical properties of soil, in addition to the harm it may cause to the environment in general.

Agronomic Concerns

When yards, gardens, pastures and other agricultural lands are flooded, the short- and long-term effects will depend on the source of the flood water and the materials carried in the water.

Flooded plants usually die because of oxygen depletion in the root zone. If the root zone remains saturated, seeds will not germinate and most plants will not grow. Floodwater must drain away or percolate into the soil before any recovery effort can begin. Where possible, remove any debris that impedes natural surface drainage. Once the floodwater has receded, air exchange into the soil will occur (unless the soil surface is covered with too much plant debris) and the soil will again support plant growth.

Dead plant material may immobilize soil nitrogen as it decays. It will also impede seed germination and plant regrowth. If plant debris is no more than about 1 inch deep, it can be tilled into the soil. If debris is deeper than 4 inches, it should be removed mechanically or with a prescribed burn. Before conducting a burn, make sure there is no hazardous flood debris such as propane tanks, pressurized-gas cylinders, refrigerators, air conditioners, petroleum containers or tires in the area. Advise fire officials of your intent to burn and adhere to all county and state regulations.

Before removing debris mechanically, make sure you know where all underground and aboveground utilities and pipelines are located. Erosion caused by the flood may have brought buried utilities to or near the surface. Before doing any digging or dirt work, call toll-free 800-DIG-TESS (800-344-8377). This service will locate all electrical, natural gas, communications and telephone lines. It may or may not locate water/sewer lines and oil/gas pipelines, but you will be told whether or not you will have to contact those utilities separately.

Sometimes a flood deposits significant amounts of soil sediment on top of the original soil surface. This is usually most pronounced along rivers or in other areas where water flow was abruptly restricted. When sandy materials are deposited on top of finer textured soils (clay loams and clays), the abrupt change in soil texture (defined as the percent sand, percent silt and percent clay) can substantially reduce subsoil water infiltration. Deep tillage usually corrects this problem if the deposit is less than 8 inches deep. If the sediment layer is thicker, contact your county Extension agent for other management options.

Floodwater makes soil less fertile by leaching away available soil nitrogen or causing it to volatilize (pass off in a vapor). A soil test should be conducted before any fertilizer is applied to determine the appropriate rate of application.

Soil Testing for Agronomic Concerns

After the soil surface is dry the soil should be tested. Specific sampling instructions are listed on Texas AgriLife Extension Service Soil, Water and Forage Testing Laboratory submittal forms. These forms can be downloaded from <http://soiltesting.tamu.edu/webpages/forms.html> or obtained at any county Extension office.

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The characteristics of the flood will determine which parameters should be measured by a soil test. If there was no saltwater associated with the flood, the Soil, Water and Forage Testing Laboratory's routine test will generally provide enough information to manage the soil in the near future. If the flood did contain saltwater, a detailed salinity test should be done also. It will provide additional information on managing and treating the salt-affected soil.

Environmental Concerns

If a flood has inundated containment systems, residential storage sheds and garages, chemical storage warehouses, industrial complexes, machinery service centers, industrial areas, sewage handling and treatment systems, or livestock feeding operations, the soil may have been contaminated by microbes, pesticides, hydrocarbons or heavy metals. This can cause general environmental and health concerns.

Soil Testing for Environmental Concerns

Microbes

The flooding of livestock facilities, sewage treatment plants and septic tanks, and overland discharges from sewers, can carry pathogenic microbes into soil and water. While microbes pose little problem in soil once the soil has dried, they may persist for a long time in contaminated wells, ponds and stagnant water. Contact your local health department for advice on sampling and/or testing water for microbial contaminants.

Pesticides

Many pesticides are highly soluble and have a relatively short life in soil. So pesticides in sediment are not usually a long-term problem in areas where they were used in normal amounts, though some plants might be lost in the short term. A bigger concern is the flooding of areas where large amounts of undiluted pesticides were stored. Warehouses and other large inventory centers are under the jurisdiction of both the Texas Commission on Environmental Quali-

ty and the U.S. Environmental Protection Agency. Other locations such as yards, farms and pest control companies are the responsibility of the landowner. Knowing which pesticides might have been released, and their toxicity, is the first step in dealing with this type of contamination. The **National Pesticide Information Center** (800-858-7378) is a clearinghouse of information on pesticide and chemical safety. Soil testing for pesticide residues can be extremely expensive, especially without information about which pesticide has been released. Only a few laboratories do pesticide analysis. Before collecting soil samples for pesticide analysis, contact the laboratory that will be conducting the analysis for specific sampling, storage and shipping instructions.

Hydrocarbons

Hydrocarbons can enter floodwater from spills at petrochemical businesses, service stations, equipment and automotive service centers, automobiles, off-road equipment, and industrial machines and equipment. Many of the lighter hydrocarbons such as gasoline and benzene will rapidly volatilize. The heavier oils and greases may persist in the soil, but except in the immediate vicinity of the spill, the concentration of oil and grease is often under the 10,000 ppm level that defines contaminated soil. Many environmental laboratories test soil for oil and grease, at costs ranging from \$25 to \$150. Contaminated soil has an oil-soaked appearance and water beads up on it rather than sinking in right away. Sampling for a hydrocarbons test is similar to sampling for agronomic testing. However, it is best to contact the laboratory for sampling and shipping instructions.

Heavy Metals

Heavy metals such as arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc may come from metal plating companies, electronics manufacturers, and similar industries. Testing is done by environmental laboratories that charge \$125 to more than \$500 per sample. The farther away a site is from the source of contamination, the less likely the soil is

to be contaminated. Sampling for a heavy metals test is similar to sampling for agronomic testing. Contact the laboratory for specific sample collection, handling and shipping instructions.

For More Information

Texas AgriLife Extension Service Soil, Water and Forage Testing Laboratory

<http://soiltesting.tamu.edu>

National Pesticide Information Center
(1-800-858-7378)

<http://npic.orst.edu/tech.htm>

These publications are available from the Texas AgriLife Extension Bookstore at
<http://agrilifebookstore.org>

Flooded Wells (ER-011)

Managing Soil Salinity (E-60)

What's In My Water? (E-176)

What Happens to Nitrogen in Soils? (E-59)

Testing Your Soil: How to Collect and Send Samples (L-1793)

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